

**Supplementary Table 1. Characteristics of Sample by Readmission from Home Health Care**

<b>Characteristics</b>	<b>No Readmission</b>	<b>Readmission</b>	<b>P</b>
	<b>% (N = 37,027)</b>	<b>% (N = 6,380)</b>	<b>Value</b>
<b>Age (median, IQR)</b>	79.0 (72.2, 85.6)	80.0 (73.0, 86.1)	<0.001
<b>Female sex</b>	63.8	62.8	0.096
<b>Race/ethnicity</b>			<0.001
Black	9.0	10.4	
White	83.2	80.9	
Hispanic	5.1	5.9	
Other	2.7	2.8	
<b>Smoking</b>	14.2	16.8	<0.001
<b>Drugs or Alcohol Dependency</b>	2.5	2.6	0.577
<b>Dual Eligibility (Medicare and Medicaid)</b>	17.7	22.5	<0.001
<b>Lives alone</b>	24.3	22.8	0.009
<b>Index Hospitalization Characteristics</b>			
Length of Stay (median, IQR)	4 (3,6)	5 (3,7)	<0.001
Elixhauser comorbidity index score (median, IQR)	3 (2,5)	4 (3,6)	<0.001
Intensive Care (during index hospitalization)	25.6	31.7	<0.001
<b>Diagnoses, Symptoms</b>			
Obesity	17.8	19.1	0.008
Surgical Wound (TKA/THA or other)	38.4	26.0	<0.001
Urinary tract infection (in prior 14 days or on prophylactic treatment)	14.1	17.3	<0.001

Urinary incontinence	44.3	50.0	<0.001
Urinary catheter in place	3.3	5.7	<0.001
Bowel Incontinence (any frequency vs. rarely/never)	13.1	19.0	<0.001
Shortness of Breath (any severity versus none)	70.1	79.6	<0.001
Pressure Ulcer (at risk of ulcer or presence of ≥stage 2 ulcer)	27.5	37.9	<0.001
Frequency of pain (< daily, daily, or all of the time)	68.4	65.3	<0.001
<b>Primary Diagnoses (from index hospitalization)</b>			
Acute myocardial infarction	2.3	3.6	<0.001
COPD	4.7	6.4	<0.001
Pneumonia	6.2	7.5	<0.001
Heart Failure	6.3	9.9	<0.001
Stroke	2.1	1.9	0.315
<b>Primary Procedures (from index hospitalization)</b>			
Coronary Artery Bypass Grafting	1.8	1.3	0.006
Total Hip or Knee Arthroplasty	14.6	3.0	<0.001
<b>Rehospitalization Factors (from OASIS)</b>			
Recent decline in status (mental, emotional, or behavioral)	11.4	14.7	<0.001
Multiple hospitalizations (≥2) in past year	32.9	47.6	<0.001
History of falls (≥2 or any fall with injury) in past year	22.8	25.6	<0.001
Taking ≥5 medications	86.9	89.7	<0.001

Frailty indicators (e.g., weight loss, exhaustion)	30.2	39.0	<0.001
<b>Overall Status of Patient</b> (fragile health with high risk of complications or serious progressive condition)	31.2	45.5	<0.001
<b>Cognitive/Behavioral/Psychiatric Conditions</b>			
Anxiety (any severity)	43.2	49.5	<0.001
Depression	3.4	4.9	<0.001
Behavioral Issues (e.g., verbal, physical, or disruptive)	1.8	2.5	<0.001
Cognitive Function Impairment (any severity)	38.7	46.7	<0.001
Memory deficit or impaired decision-making (any severity)	21.0	24.9	<0.001
Psychiatric nursing services – receiving	0.6	0.5	0.556
<b>Sensory/Expressive</b>			
Hearing - any impairment	36.6	41.6	<0.001
Visual – any impairment	19.9	24.0	<0.001
Verbal Understanding – any impairment	34.9	42.0	<0.001
Verbal Expression – any difficulty	33.2	40.8	<0.001
<b>Home Health Factors</b>			
Nurse completed HHC start of care	90.9	94.7	<0.001
Therapies – infusion, total parental nutrition, or tube feeds	4.1	6.5	<0.001
Respiratory therapies – oxygen, ventilator, or positive airway pressure	18.4	25.9	<0.001

**Prior Activities of Daily Living** (any assistance)

Ambulation – any assistance	43.3	52.3	<0.001
Household (e.g., meal prep, laundry, shopping)	68.6	78.4	<0.001
Self-care (e.g., grooming, dressing, and bathing)	47.0	56.9	<0.001
Transfers	38.4	47.5	<0.001

**Current Activities of Daily Living** (assistance from another person)

Ambulation (able to walk only with supervision/assistance of another person, or unable to ambulate, or bedfast)	42.8	47.7	<0.001
Bathing	89.2	90.6	0.001
Dressing lower body	87.6	88.9	0.003
Dressing upper body	82.2	85.6	<0.001
Feeding	51.7	58.4	<0.001
Grooming	75.7	79.9	<0.001
Toilet transferring	62.6	67.2	<0.001
Toileting hygiene	68.0	73.0	<0.001
Transferring	86.7	88.3	<0.001
<b>Oral Medication Management</b> (needing assistance)	67.9	77.7	<0.001

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**Supplementary Table 2. Odds Ratios for Variables in Full Predictive Model**

<b>Characteristics</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Age Category</b>		
65-69.9	ref	--
69.9-74.7	0.92	0.84, 1.02
74.7-79.2	0.93	0.84, 1.02
79.2-83.5	0.91	0.82, 1.00
83.5-88.0	0.91	0.82, 1.01
88.0-112.3	0.88	0.79, 0.98
<b>Female sex</b>	0.97	0.91, 1.03
<b>Race/ethnicity</b>		
Black	ref	--
White	1.02	0.92, 1.12
Hispanic	1.04	0.90, 1.20
Other	0.97	0.80, 1.16
<b>Smoking</b>	1.04	0.96, 1.12
<b>Dual Eligibility (Medicare and Medicaid)</b>	1.10	1.02, 1.18
<b>Lives alone</b>	0.94	0.88, 1.01
<b>Index Hospitalization Characteristics</b>		
Length of Stay		
1	ref	--

2	0.83	0.72, 0.96
3	0.89	0.78, 1.02
4	1.00	0.87, 1.15
5	1.06	0.92, 1.22
6	1.13	0.97, 1.31
7	1.17	1.00, 1.37
≥8	1.36	1.19, 1.55
Elixhauser comorbidity index		
0	ref	--
1	1.03	0.81, 1.31
2	1.17	0.93, 1.47
3	1.32	1.06, 1.66
4	1.47	1.17, 1.85
5	1.57	1.25, 1.98
6	1.78	1.41, 2.25
7	2.03	1.60, 2.58
8	1.84	1.42, 2.39
9	2.11	1.59, 2.81
≥10	2.12	1.51, 2.99
Intensive Care (during index hospitalization)	1.01	0.95, 1.07
<b>Diagnoses, Symptoms</b>		
Surgical Wound		
THA/TKA	0.35	0.30, 0.41

Other	0.90	0.83, 0.96
Urinary tract infection (in prior 14 days or on prophylactic treatment)	1.02	0.94, 1.10
Urinary incontinence	1.02	0.96, 1.09
Urinary catheter in place	1.40	1.23, 1.60
Bowel Incontinence (any frequency vs. rarely/never)	1.11	1.02, 1.20
Shortness of Breath (any severity versus none)	1.10	1.03, 1.19
Pressure Ulcer (risk of ulcer or presence of $\geq$ stage 2 ulcer)	1.17	1.10, 1.25
Frequency of pain (< daily, daily, or all of the time)	1.00	0.94, 1.07
<b>Primary Diagnoses</b> (from index hospitalization)		
Acute myocardial infarction	1.38	1.18, 1.61
Pneumonia	0.89	0.80, 0.99
Stroke	0.96	0.79, 1.17
<b>Primary Procedures</b> (from index hospitalization)		
Coronary Artery Bypass Grafting	0.63	0.49, 0.80
<b>Rehospitalization Factors</b> (from OASIS)		
Recent decline in status (mental, emotional, or behavioral)	1.01	0.92, 1.10
Multiple hospitalizations ( $\geq 2$ ) in past year	1.32	1.25, 1.40
History of falls ( $\geq 2$ or any fall with injury) in past year	0.97	0.90, 1.03
Taking $\geq 5$ medications	1.01	0.92, 1.11
Frailty indicators (e.g., weight loss, exhaustion)	1.07	1.01, 1.14
<b>Overall Status of Patient</b> (fragile health with high risk of complications or serious progressive condition)	1.21	1.14, 1.28

**Cognitive/Behavioral/Psychiatric Conditions**

Anxiety (any severity)	1.01	0.95, 1.07
Behavioral Issues (e.g., verbal, physical, or disruptive)	1.12	0.93, 1.35
Cognitive Function Impairment (any severity)	1.00	0.92, 1.09
Memory deficit or impaired decision-making (any severity)	0.89	0.82, 0.96
Psychiatric nursing services – receiving	0.77	0.53, 1.11

**Sensory/Expressive**

Hearing - any impairment	1.01	0.94, 1.07
Visual – any impairment	0.97	0.90, 1.04
Verbal Understanding – any impairment	0.97	0.89, 1.06
Verbal Expression – any difficulty	1.03	0.94, 1.12

**Home Health Factors**

Nurse completed HHC start of care	1.11	0.98, 1.26
Therapies – infusion, total parental nutrition, or tube feeds	1.23	1.10, 1.39
Respiratory therapies – oxygen, ventilator, or positive airway pressure	1.05	0.98, 1.12

**Prior Activities of Daily Living (any assistance)**

Ambulation – any assistance	0.95	0.84, 1.06
Household (e.g., meal prep, laundry, shopping)	1.08	0.99, 1.17
Self-care (e.g., grooming, dressing, and bathing)	0.98	0.90, 1.08
Transfers	1.09	0.97, 1.22

**Current Activities of Daily Living (assistance from another**



person)		
Ambulation (able to walk only with supervision/assistance of another person, or unable to ambulate, or bedfast)	1.03	0.97, 1.10
Bathing	1.03	0.92, 1.15
Dressing lower body	0.93	0.80, 1.10
Dressing upper body	1.05	0.89, 1.22
Feeding	1.02	0.96, 1.09
Grooming	1.00	0.90, 1.11
Toilet transferring	0.97	0.89, 1.06
Toileting hygiene	0.99	0.90, 1.08
Transferring	1.03	0.93, 1.14
<b>Oral Medication Management</b> (needing assistance)	1.16	1.08, 1.25

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**Supplementary Table 3. Top Ten Variables in Gradient Boosting Machine Predictive Model**

<b>Variable</b>	<b>Relative Influence*</b>
<b>Elixhauser Comorbidity Index Score</b>	25.4
<b>Length of Stay</b>	15.1
<b>Surgical Wound - TKA/THA or other</b>	13.7
<b>Multiple hospitalizations (<math>\geq 2</math>) in past year</b>	8.6
<b>Overall Status of Patient</b> (fragile health with high risk of complications or serious progressive condition)	7.0
<b>Age Category</b>	3.7
<b>Pressure Ulcer (risk of ulcer or presence of &gt;stage 2 ulcer)</b>	3.3
<b>Urinary catheter in place</b>	2.3
<b>Therapies – infusion, total parental nutrition, or tube feeds</b>	1.5
<b>Oral Medication Management</b>	1.4

\*Relative influence is an assessment of aggregate contribution to overall model fit and is summed from contributions to trees in the model